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SMD Operations Procedures Manual

8.1.1.41 TEST OF SAFETY INTERLOCKS FOR THE SHORT SAMPLE TEST FACILITY, MAGNET POWER SUPPLY

Text Pages 1 through 10
Attachment 1,2

Hand Processed Changes

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Approved:

Signature on File
Division Head

10/7/04
Date

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**Test of Safety Interlocks for the
Short Sample Test Facility, Magnet Power Supply**

1.0 Purpose and Scope

- 1.1 To provide a procedure for testing the Kirk Locks, electrical door interlocks, "crash" push buttons, DC Overcurrent protection circuits, and warning lights associated with the Short Sample Magnet Test Power Supply.

2.0 Responsibilities

- 2.1 The Cognizant Engineer for the Short Sample Magnet Test Power Supply, or the Electrical Systems Section Head, shall:
- A. designate those persons authorized to perform the procedure;
 - B. establish and maintain a list of authorized persons;
 - C. appoint a Cognizant Technician for the interlock test database;
 - D. review the completed "Check List for Safety Interlock Test" (Attachment 1) and sign the "Interlock Test Approval Form" (Attachment 2).
- 2.2 The Cognizant Technician shall:
- A. initiate the procedure, when required;
 - B. establish and maintain a paper database for the interlock test;
 - C. arrange for the "Interlock Test Approval Form" to be posted at the required locations.
- 2.3 The Authorized Person shall:
- A. perform the main actions of the procedure;
 - B. complete the "Check List for Safety Interlock Test".

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3.0 Prerequisites

3.1 The Authorized Person shall:

- A. be instructed by the Cognizant Engineer;
- C. be trained as a "Responsible Employee", as per ESH Standard 1.5.1, "Lockout/Tagout Requirements".

4.0 Precautions

- 4.1 The procedure requires that the Kirk Lock system be bypassed, or "defeated", during some tests. The Kirk Lock system shall be restored to full working order after the procedure is completed.
- 4.2 All doors that were unlocked for the purpose of testing the interlocks shall be locked when the procedure is completed.

5.0 Procedure

Note 1: The test should be performed every six months.

Note 2: Use the Check List (Attachment 1) as a guide in locating each safety device. As each device is tested successfully, check it off.

Note 3: If a device fails, stop work and immediately notify the Cognizant Engineer and the ES&H Coordinator.

Kirk Key Lock Mechanical Interlock

Note: This procedure should be performed concurrently with OPM 8.1.1.7, Test of Safety Interlocks of the Short Sample Test Facility, Twin 15 kA Power Supplies.

OVERVIEW

Note: The safety Kirk lock system of the Short Sample Test Facility was designed to accommodate multitasking within in the various stages of setup and testing of Superconducting magnet cable. Below is explanation of each integrated part.

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Within each test dewar there are three sets of safety enclosures that protect the power leads used to energize superconducting test cable and a magnet coil. Each positive and negative power lead and magnet coil has an independent cover with the following designation. S4+, S4-, M4, S5+, S5-, M5, S6+, S6-, M6.

Each dewar test cage entry door has a Kirk lock installed on them designated as G4, G5, and G6. Dewar cage entry doors G4 and G5 have two doors that share the same Kirk key.

In the Short Sample control room there are three banks of four Kirk key locks. These are designated as the Magnet Cover Safety Kirk Key Interlock Logic Panel. Next to that panel are four banks of five Kirk Key locks. This is called the Power Supply Safety Kirk Key Interlock Logic Panel.

On each power supply main disconnect switch is a Kirk Key lock labeled PS, PSS, PM and PSM. Kirk Keys PS and PM are the final results after all the correct Kirk Key logic has been satisfied in the Short Sample control room. Then each main power switch can be activated to each Short Sample power supply to conduct cable testing. The PSS and PSM Kirk keys are used to gain entry to the power supply doors for periodic maintenance. These Kirk keys in conjunction with the PS and PM Kirk key can gain entry to the Short Sample Link Box.

SEQUENCE OF OPERATION OF THE KIRK KEY SAFETY INTERLOCK SYSTEM

To perform a superconducting cable test, the Short Sample control room operator must insure that all safety covers on both test dewars that are not in use be secured and have Kirk key inserted in the proper designated Kirk locks (Magnet Cover Safety Kirk Key Interlock Logic Panel). Once this condition is satisfied, the Magnet Supply key (MS#) can be removed and inserted into the Power Supply Safety Kirk Key Interlock Logic Panel along with the gate key from the dewar facility be used for the cable test.

When all these conditions have been satisfied in the Power Supply Safety Kirk Key Interlock Logic Panel, both the Power Supply Short Sample Key (PS#) and Power Supply Magnet (PM#) can be removed. These Kirk Keys can now be inserted into their respective Kirk locks to activate the main power supply to conduct superconducting cable testing.

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- 5.1 The Kirk Key Lock Mechanical Interlock is tested by performing the following steps:
 - 5.1.1 Use PM key from the Short Sample Control Room, Power Supply Safety Kirk Key Interlock Logic Panel to open the Kirk Lock magnet power supply electrical current feed.
 - 5.1.2 Place the Switch in the ON position.
 - 5.1.3 Attempt to turn the keys to remove the PM and PSM. Verify that this cannot be done.
 - 5.1.4 Place the Switch in the OFF position.
 - 5.1.5 Use the PSM key to unlock the Control Cubicle door on the left side of the Power Supply.
 - 5.1.6 Attempt to remove the key while the door is unlocked. Verify that this cannot be done.
 - 5.1.7 Re-lock the door and remove the key.

Electrical Door Interlocks

- Note 1. An authorized control room technician for this test must operate the Supply.*
- Note 2. An Authorized Cognizant Technician may assist the control room technician by tripping the interlocks while the technician monitors and controls the Supply.*
- Note 3. Refer to Attachment 1 ("Check List for Test of Safety Interlocks") for locations of all of the Door Interlocks. Interlocks on doors with Kirk Locks are noted as such on the Check List.*

- 5.2 Performing the following steps to test the electrical Door Interlocks on those doors with Kirk key locks:
 - 5.2.1 Defeat the captive key lock permitting access with power on.
 - 5.2.2 Leave the door open enough to activate the Interlock switch.

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- 5.2.3 Place the Input Disconnect Switch in the ON position.
- 5.2.4 On the Power Supply front panel, depress the RESET pushbutton to clear faults.
- 5.2.5 Place the REMOTE/LOCAL switch in the REMOTE position.
- 5.2.6 Through computer command, attempt to reset faults. Verify that the computer display indicates a fault and that the "DOOR" LED on the control rack is lit. The LED is located on the card labeled POWER SUPPLY CONTROL CARD.
- 5.2.7 Attempt to turn the Supply on through computer command. Verify that this cannot be done.
- 5.2.8 Place the Input Disconnect Switch in the OFF position.
- 5.2.9 Close the door and lock the Kirk key lock.
- 5.2.10 Place the Input Disconnect Switch in the ON position.
- 5.2.11 Through computer command, reset faults. Verify that the "door" fault resets.
- 5.2.12 Place the Input Disconnect Switch in the OFF position.
- 5.2.13 Repeat steps 5.2.1 to 5.2.12 for all electrical Door Interlocks on those doors with Kirk key locks.

Crash Buttons

- 5.3 Performing the following steps too tests the crash buttons:
 - 5.3.1 Place the Input Disconnect Switch in the ON position.
 - 5.3.2 On the Power Supply front panel, depress the RESET pushbutton to clear faults.
 - 5.3.3 Place the REMOTE/LOCAL switch in the REMOTE position.

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- 5.3.4 Through computer command, reset faults and place the Supply in the ON state with an output of zero amps. A small idle current will be present.
- 5.3.5 Depress a crash button. Verify that the Supply shuts off by observing the meters on the front panel of the Supply. All meters should indicate zero.
- 5.3.6 Repeat steps 5.3.2 to 5.3.5 for the other crash buttons to be tested as listed on the check list.

DC Overcurrent

- 5.4 The DC Overcurrent interlock of each power supply is tested by performing the following steps:
 - 5.4.1 On the Power Supply front panel, locate the meter and potentiometer labeled "D.C. AMPS". A red needle should be visible on the meter.
 - 5.4.2 Record the setting of the red needle.
 - 5.4.3 Change the needle setting to 500 amps.
 - 5.4.4 Place the Input Disconnect Switch in the ON position.
 - 5.4.5 On the Power Supply front panel, depress the RESET pushbutton to clear faults.
 - 5.4.6 Place the REMOTE/LOCAL switch in the REMOTE position.
 - 5.4.7 Through computer command, reset faults and place the Supply in the ON state.
 - 5.4.8 Command an output of 1000 amps and a ramp rate of 50 amps/second.
 - 5.4.9 Verify that the Supply shuts off when an output of 500 amps is reached.
 - 5.4.10 Set the red needle to its original setting.

"PS ON" Warning Lights

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- 5.5 The "PS ON" Warning Lights are tested by performing the following steps:
 - 5.5.1 Place the Input Disconnect Switch in the ON position.
 - 5.5.2 On the Power Supply front panel, depress the RESET pushbutton to clear faults.
 - 5.5.3 Place the REMOTE/LOCAL switch in the REMOTE position.
 - 5.5.4 Through computer command, reset faults and place the Supply in the ON state.
 - 5.5.5 Verify that all of the warning lights listed on the CheckList are flashing.
 - 5.5.6 Turn off the Supply.
 - 5.5.7 Verify that the warning lights extinguish.

<Authorized Person:

- 5.6 Complete, date, and sign the checklist.

<Cognizant Engineer:

- 5.7 Review the checklist and, if approved, sign the "Interlock Test Approval" form (Attachment 2).

<Cognizant Technician:

- 5.8 Post a copy of the signed "Interlock Test Approval" form on the Control Rack.
- 5.9 File one copy of the checklist and one copy of the Approval Form.

6.0 Documentation

- 6.1 Check List for Test of Safety Interlocks.
- 6.2 Interlock Test Approval Form

7.0 References

- 7.1 ESH Standard 1.5.1, "Lockout/Tagout Requirements".

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8.0 Attachments

1. Check List for Test of Safety Interlocks
2. Interlock Test Approval Form

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Attachment 1

CHECK LIST FOR TEST OF SAFETY INTERLOCKS

Short Sample Test Facility, Magnet Power Supply

DESIGNATION	DESCRIPTION	U
DTF KL-1	Kirk lock on F.D.S. 48 Disconnect Switch	
DTF KL-2	Kirk lock on power supply control cubicle door	
DTF DIL-1	Door Interlock on power supply control cubicle door (w/ Kirk Lock)	
DTF DIL-2	Power supply front panel Interlock (screws will have to be removed to activate)	
DTF DCO-1	DC overcurrent interlock for power supply	
DTF CB-1	Crash button on power supply	
DTF CB-2	Crash button in Cryo CR	
DTF CB-3	Crash button Short Sample CR	
DTF WL-1	Warning light over power supply	
DTF WL-2	Warning light over Link Box	

Test date _____ Tested by _____ Life# _____

Tested by _____ Life# _____

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Attachment 2

Safety Interlock Test Approval

The safety interlocks of the Short Sample Test Facility Magnet Power Supply System have been tested and approved

Approval Date _____

The approval is valid until the expiration date shown. DO NOT OPERATE THE SHORT SAMPLE TEST FACILITY MAGNET POWER SUPPLY AFTER THE EXPIRATION DATE.

Expiration Date _____

Approval Signature _____
Post on Control Rack near power supply

=====

Safety Interlock Test Approval

The safety interlocks of the Short Sample Test Facility Magnet Power Supply System have been tested and approved

Approval Date _____

The approval is valid until the expiration date shown. DO NOT OPERATE THE SHORT SAMPLE TEST FACILITY MAGNET POWER SUPPLY AFTER THE EXPIRATION DATE.

Expiration Date _____

Approval Signature _____
Post on remote Control Rack (in CR)

=====

Safety Interlock Test Approval

The safety interlocks of the Short Sample Test Facility Magnet Power Supply System have been tested and approved

Approval Date _____

The approval is valid until the expiration date shown. DO NOT OPERATE THE SHORT SAMPLE TEST FACILITY MAGNET POWER SUPPLY AFTER THE EXPIRATION DATE.

Expiration Date _____

Approval Signature _____
Post on power supply

=====

Safety Interlock Test Approval

The safety interlocks of the Short Sample Test Facility Magnet Power Supply System have been tested and approved

Approval Date _____

The approval is valid until the expiration date shown. DO NOT OPERATE THE SHORT SAMPLE TEST FACILITY MAGNET POWER SUPPLY AFTER THE EXPIRATION DATE.

Expiration Date _____

Approval Signature _____
File copy

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